

REMARKS

Claims 1-36 remain pending in this application. By this response, claims 1, 3, 20, 29, 33 and 35 have been amended. Claim 37 has been added. Claims 29 and 35 have been amended to replace the erroneous use of the term “file” with the term “data” for reasons unrelated to patentability and solely for the purpose of making the claim language consistent.

The Obviousness Rejections

The Final Office Action rejected claims 1-15, 19-20, 27-29 and 30-36 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application No. 2005/0246393 to Coates et al and further in view of U.S. Patent Application No. 2002/0083118 to Sim.

Claim 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Coates in view of Sim and further in view of U.S. Patent Application No. 2004/0255016 to Hundscheidt et al.

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Coates in view of Sim and further in view of U.S. Patent No. 6,748,420 to Quatrano et al.

Claims 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Coates in view of Sim and further in view of U.S. Patent Application No. 2002/0059263 to Shima et al.

Claims 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Coates in view of Sim and further in view of U.S. Patent Application No. 2004/0003266 to Moshir et al.

Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Coates in view of Sim and further in view of U.S. Patent Application No. 2006/0112151 to Manley et al.

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Coates in view of Sim and further in view of U.S. Patent Application No. 2006/0184589 to Lees et al.

The present claims relate to a virtual file system that uses an adaptive load balancer to present a virtual file system to a client computer system. The virtual file system provides access to an aggregated set of files stored by a plurality of server file systems respectively associated with a plurality of server computer systems. Access to the aggregated set of files is provided through the virtual file system. When a client file access transaction is received from the client computer system, the client file access transaction specifying a file access operation to be performed relative to the virtual file system presented to the client computer

system. The client file access transaction is processed in relation to metadata associated with the virtual file system. The metadata includes translation data that allows translation between a client file operation and a server file operation. If the file access operation requires access to a file stored by the plurality of server file systems, then the client file access transaction is translated, using the metadata associated with the virtual file system, into a server file access transaction for access to the file maintained within one of the plurality of server computer systems according to the file access operation specified by the client file access transaction. If the file access operation does not require access to a file stored by the plurality of server file systems, then metadata associated with the virtual file system is accessed to complete processing of the file access operation specified by the client file access transaction.

Coates discloses a distributed storage cluster architecture. Coates uses a series of storage ports to access distributed object storage managers (DOSM). Each of the distributed object storage managers (DOSM) handles download transactions using a high speed disk cache in conjunction with a storage system. (§ 63). Coates does not disclose the use of metadata for certain file transaction operations that do not require file access. Coates also does not disclose a load balancer that copies files that have a historically high demand in different actual server systems.

Coates discloses a network storage system that “includes a virtual file system (“VFS”) that manages the files of the network storage system, and a storage center that stores the files.” (*See* Abstract). Coates further discloses that “[t]he VFS and the storage center are separated, such that a client accesses the VFS to conduct file system operations and the client accesses the storage center to upload/download files.” (*See* Abstract; §§ 54-55). Coates discloses that files can be uploaded or downloaded from the storage center without ever communicating with the VFS such as, for example, if the SRL is found in a directory cache of the storage port. (*See* § 154; FIG. 23). Accordingly, Coates fails to disclose or suggest a virtual file system providing access to an aggregated set of files stored by a plurality of server file systems, wherein the access to the aggregated set of files is provided through the virtual file system.

The Final Office Action has conceded that Coates does not disclose the access to the aggregated set of files is provided through the virtual file system. (p. 5). The Final Office Action has cited Sim as disclosing access to an aggregated set of files. (p. 5). Sim relates to a storage system that enables large payloads (files) to be delivered to users by storing large files in multiple portions distributed throughout the network. (§ 41). Sim discloses use of a virtual file control system to piece together a file that may be stored on different storage

systems. (§ 87). The need for Sim to store a file on different storage systems would prevent the combination with Coates. Coates would only be capable of loading one file via a file handle and therefore the combination of the systems would prevent Sim from being used for its intended purpose of accessing a file stored across multiple storage systems.

Claims 1, 20, 29 and 33 have been amended to require that the metadata include translation data. Coates does not disclose metadata that includes translation data. The Final Office Action has cited page 7, § 94, page 8, § 103, page 13, § 147, and page 14, § 150 in Coates as disclosing translation “between the client’s local file system and the network storage file system.” (p. 6). However, none of these sections discloses use of the metadata for this translation. Paragraph 94 describes the process of a point to point connection and the generation of a fingerprint of the object file and establishment of a file handle. Paragraph 94 does not disclose the use of metadata including translation data. Similarly, paragraph 103 discloses a folder table 1210 with a field for metadata but does not disclose that the metadata includes translation data. Paragraph 147 only describes the translation between the local file system and the network storage system but does not describe the use of metadata or metadata including translation data. In fact, paragraphs 150 and 154 describe the process of translation as using a file system translator 2320 which includes storage system kernel processes 2350 without metadata. Paragraphs 153 and 154 explain that to maintain the mapping, the storage system kernel processes 2350 obtain storage handles from storage system access processes 2330. Coates thus describes obtaining storage handles for purposes of translation by the software from the operating system kernels instead of relying on metadata for this information. In fact, the metadata in Coates does not include translation data as the only explanation for metadata in Coates describes state information used in the local file system. (§ 258). Since Coates does not disclose metadata including translation data, these claims and their dependents are allowable over Coates and Sim.

Further, claims 1 and 33 require “if the file access operation does not require access to a file stored by the plurality of server file systems, then accessing metadata associated with the virtual file system to complete processing of the file access operation specified by the client file access transaction.” Claims 29 and 35 have similar requirements in relation to the data. Coates does not disclose not requiring access to a file or data and accessing metadata associated with the virtual file system. The Final Office Action has cited § 154 of Coates as disclosing this element. Paragraph 154 only describes obtaining network storage file system information storage handles and directory information but the file is always accessed either through the cache associated with the storage port or another cache associated with another

storage handle. This paragraph therefore only discloses accessing metadata, but does not disclose using metadata to complete processing of the file access operation.

Applicant has amended claim 3 to require that the physical file system parameters include a directory location. Amended claim 3 is separately allowable as it requires maintaining the metadata associated with the virtual file system in at least one forwarding table containing forwarding table entries that provide a mapping of virtual file system parameters to physical file system parameters including a directory location. Coates fails to disclose, teach or suggest at least this feature. Coates discloses that the object files, stored in one or more storage clusters, are not associated with a “central authority” that specifies a physical location for the object files. The VFS, in part, stores an object fingerprint for a file, but does not indicate a location for the file. (*See* ¶ 77). The Final Office Action cites ¶ 98 for the location of the file. (p. 2). However, the list of data described in Coates describes the customer file directory as including file name and network storage system file identifiers. This does not disclose the physical file system parameters such as the directory location as now required by amended claim 3.

Claim 5 is separately allowable because maintaining an active transaction table that associates client file access transactions to corresponding server file access transactions. The evidence cited from Coates fails to disclose, teach or suggest this feature. The Final Office Action asserts that ¶¶ 102-106 of Coates disclose an active transaction table. However, the cited portions of Coates relate to an implementation for structuring a virtual file system as a hierarchical file system of “directories or folders arranged in levels.” (*See* ¶¶ 101-102). To implement this hierarchical file system, Coates discloses using database tables for storing various fields such as, for example, “folder ID”, “parent folder ID”, “file handle”, and “Customer ID”, which “identifies the customer that owns the file.” (*See* ¶ 104) (emphasis added). Coates does not disclose, teach or suggest maintaining active directory or file transactions in these tables. The Final Office Action has cited ¶ 110 as an example of a move request as an active transaction. (pp. 2-3). Paragraph 110 only relates to a move file operation but does not disclose determining whether the table includes an active transaction and creating a new table entry if the transaction is a new transaction. Coates would require the same procedure for existing transactions as well as new transactions and does not disclose maintaining data relating to active transactions.

Claim 12 is separately allowable because it requires “detecting a trend of access to a file within the virtual file system by tracking file access patterns to the file” and “in response to detecting the trend of access, performing a migration operation on the file for which the

trend is detected in order to manage access to the file.” The Final Office Action has cited ¶ 118 of Coates as disclosing this element. However, ¶ 118 only discloses using DOSMs based on available resources and that a DOSM is selected to fetch a high demand object. There is no disclosure of detecting a trend of access by tracing file access patterns. Further, Coates may disclose performing a migration operation, but such an operation is not based on a trend. Rather, Coates appears limited to utilizing automatic caching of objects as they are returned to the requester. For example, Coates explains that “based on available resources, the load balancing fabric 310 selects, for two separate requests, the DOSM 2 and the DOSM ‘n’ to handle the two requests.” ¶ 118 (emphasis added). Thus, whether a DOSM stores a high demand object is purely a matter of chance that the DOSM is selected by the load balancing fabric to handle a request for a file. That is, Coates does not disclose, teach or suggest detecting a trend or performing a migration operation on a high demand object. For at least this additional reason, Coates does not disclose or suggest claim 12.

Claims 13-14 are separately allowable because they require “replicating the file to at least one server computer system that does not contain the file within its file system at the time of detecting frequent access to a file.” Further claim 13 requires “detecting frequent access to a file over a time period.” The Final Office Action has cited ¶¶ 117-118 of Coates that describe the caching of high demand files. (p. 13). However, the caching of such files occurs in a cache that is in the same server computer system. Coates does not disclose replicating the file to a server system that does not contain the file. In fact, Coates discloses the opposite, as Coates discloses multiple files in the same cache for faster access. Further, neither of these paragraphs discloses detecting frequent access to a file as required by claim 13. Claims 13-14 thus are separately allowable because they require the replication of the file in at least one server computer system that does not contain the file.

New claim 37 requires that each of the files are stored in their entirety by one file system and one computer system. The combination of Sim and Coates does not disclose a virtual file system where the entirety of the file or data is stored in one data system and one computer system since Sim specifically discloses breaking up a file across multiple file or data systems. New claim 37 therefore is independently allowable.

It is the Applicants' belief that all of the claims are now in condition for allowance and action towards that effect is respectfully requested. If there are any matters which may be resolved or clarified through a telephone interview, the Examiner is requested to contact the undersigned attorney at the number indicated.

Respectfully submitted,

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By /Wayne L. Tang/
Wayne L. Tang
Reg. No. 36,028
NIXON PEABODY, LLP.
1100 Clinton Square
Rochester, New York 14604-1792
Telephone: (585) 263-1014
Facsimile: (585) 263-1600